NASA Applied Sciences Program

NOAA-NASA Workshop on Integrating Satellite Data Products for Ecosystem-based Management of Living Marine Resources

May 3-5, 2006

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NASA Applied Sciences Program
Science Mission Directorate

"Extending the societal and economic benefits of NASA research in Earth science, information, and technology …"

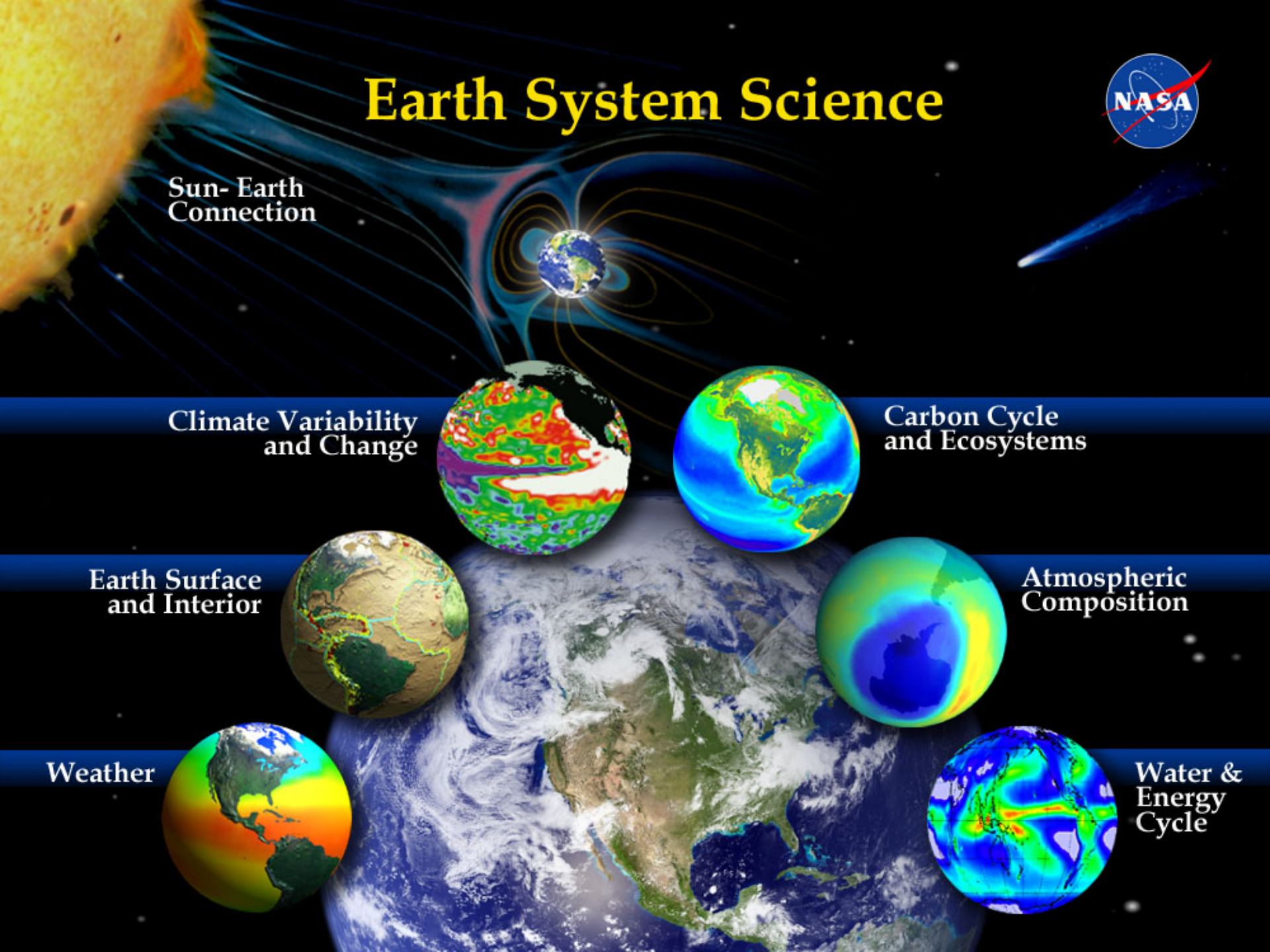
NASA Applied Sciences Program

The overarching purpose of the Applied Sciences Program is to expand the societal benefits of the nation's investments in NASA Earth science research.

Through partnerships, the Program enables the use of Earth science research to enhance the performance of decision support tools that organizations use to serve their management, business, and policy responsibilities.

- *Work with partners to assess the potential value*
- *Where valuable, work to determine pathways to use the Earth science products on a sustained basis*

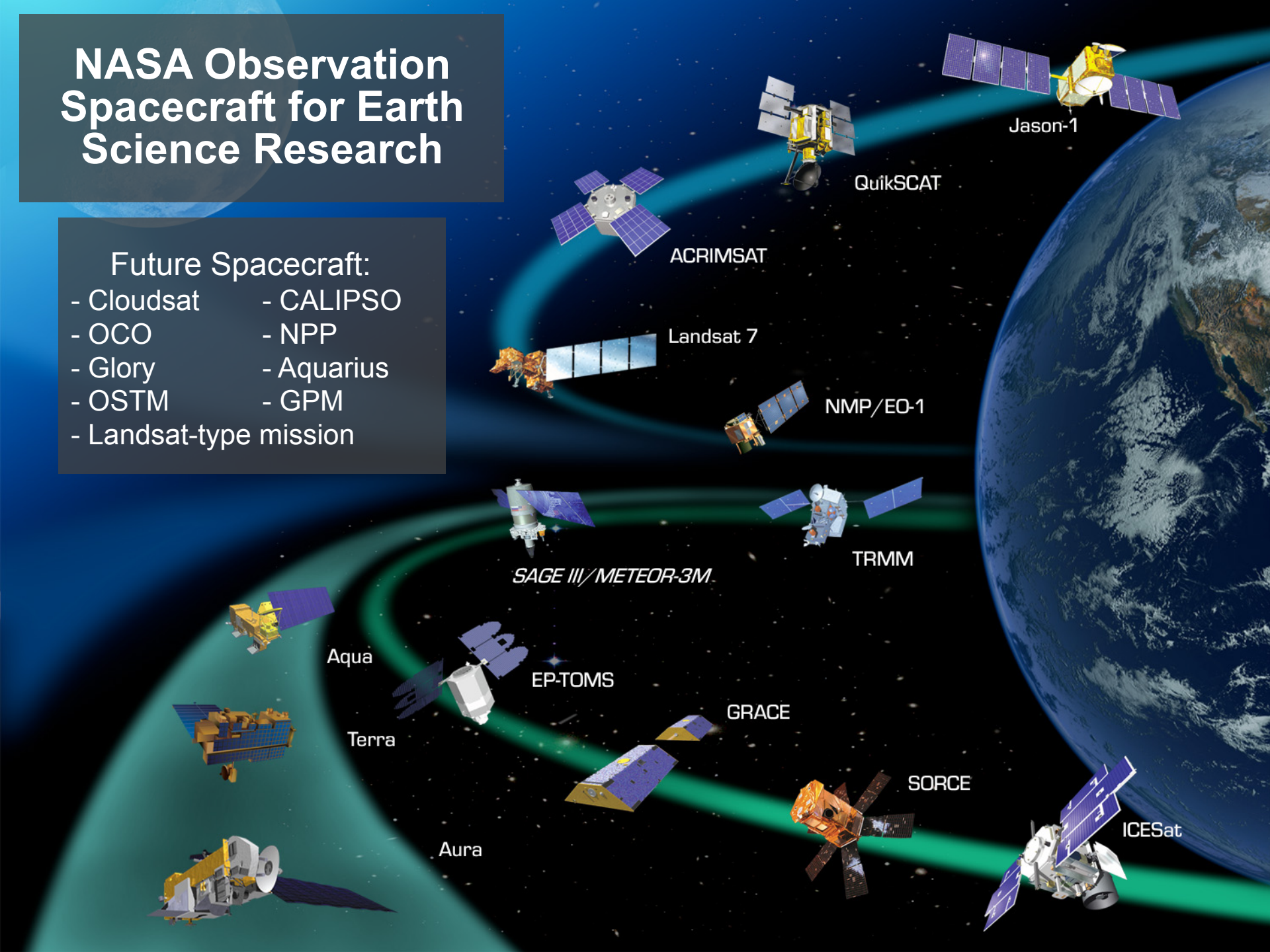
Earth System Science



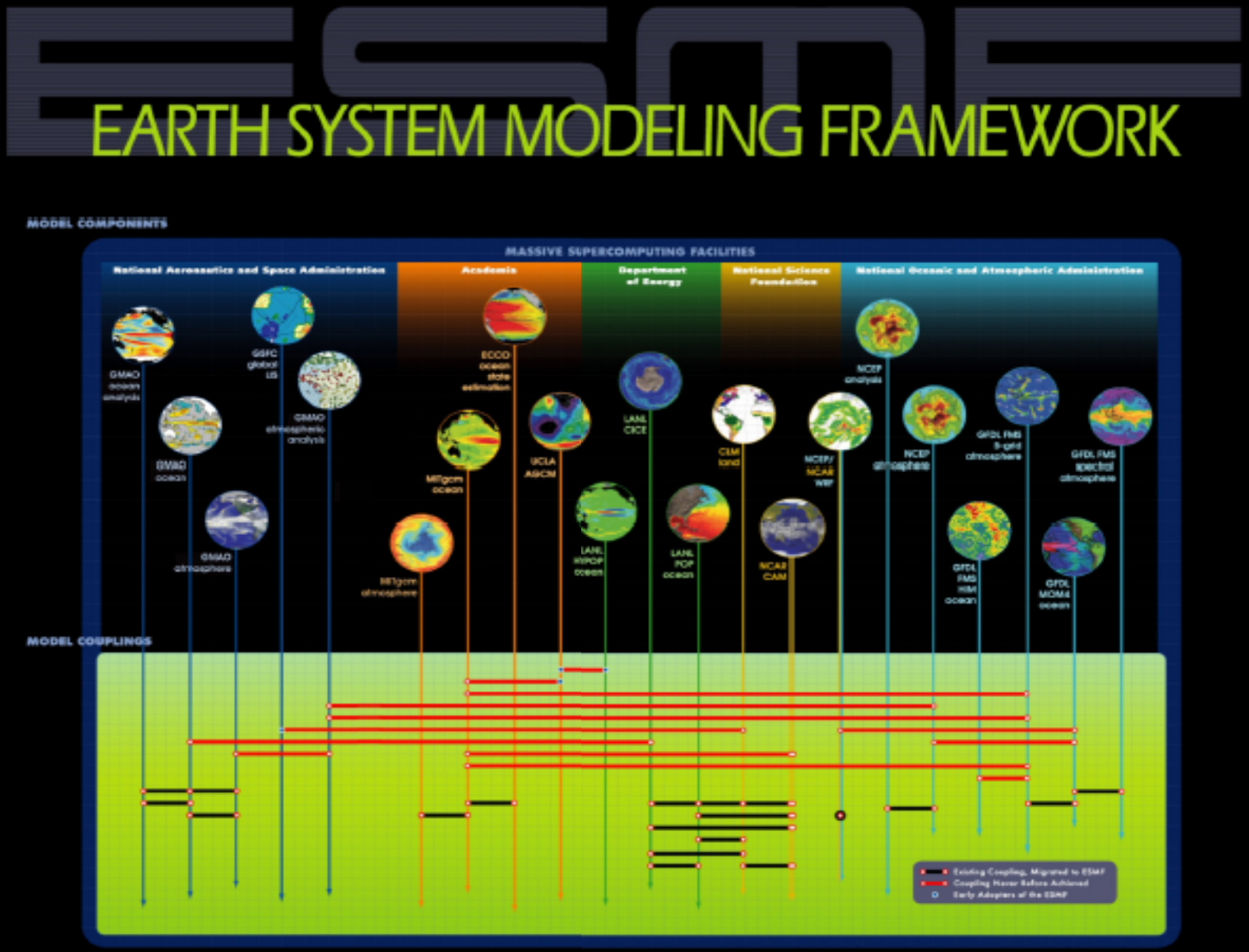
NASA Observation Spacecraft for Earth Science Research

Future Spacecraft:

- Cloudsat
- OCO
- Glory
- OSTM
- CALIPSO
- NPP
- Aquarius
- GPM
- Landsat-type mission



Earth System Models



Policy Directives

National Aeronautics and Space Act of 1958 (as amended)

Section 102. The preservation of the role of the United States as a leader in aeronautical & space science and technology and in the application thereof …

Section 203. The [NASA] Administration shall … (3) provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

National Space Policy (1996)

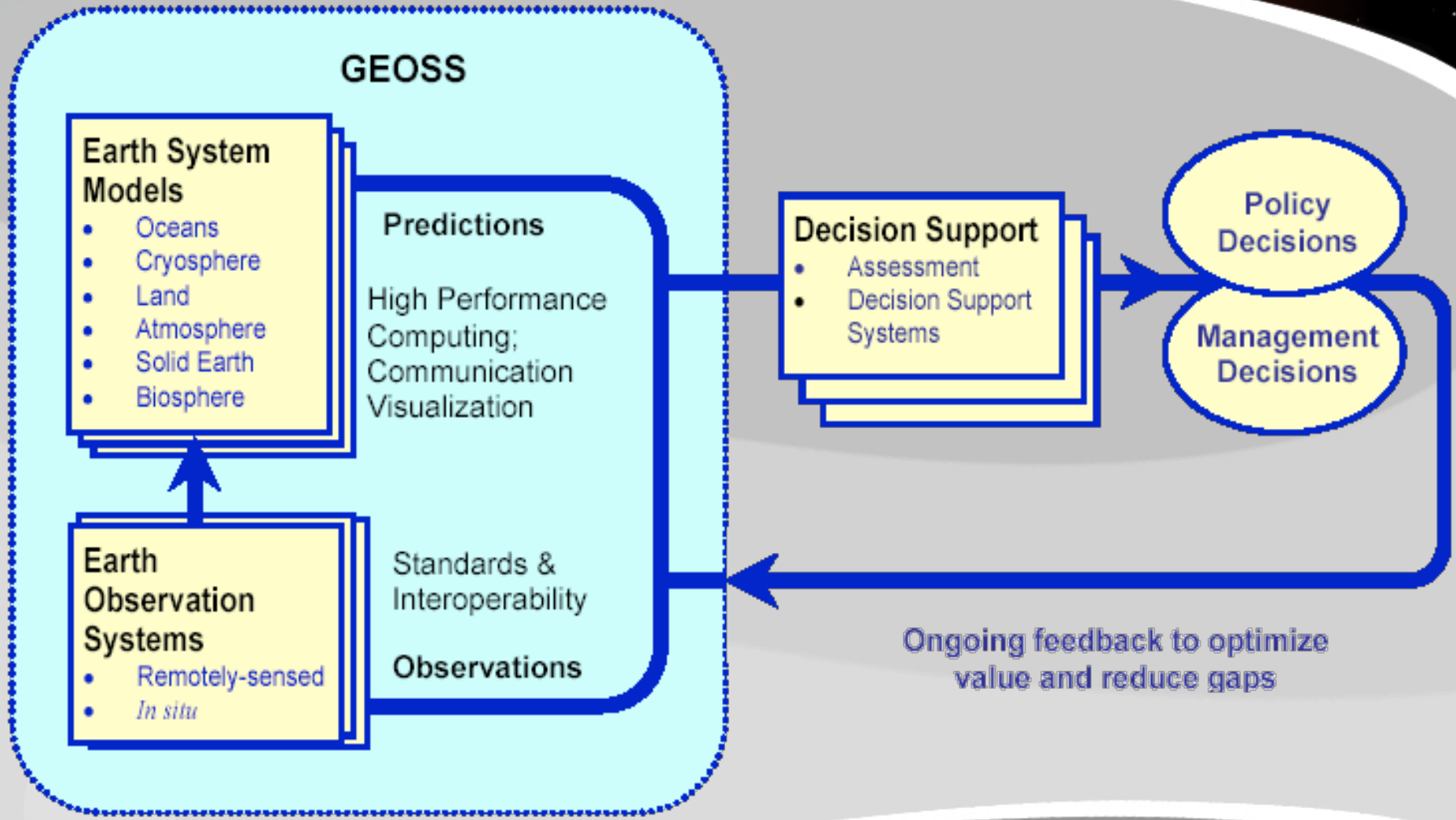
NASA, in coordination with other departments and agencies as appropriate, will focus its research and development efforts in (parts of longer list):

- Earth observation to better understand global change and the effect of natural and human influences on the environment;
- Space technologies and applications to develop new technologies in support of U.S. Government needs and our economic competitiveness.

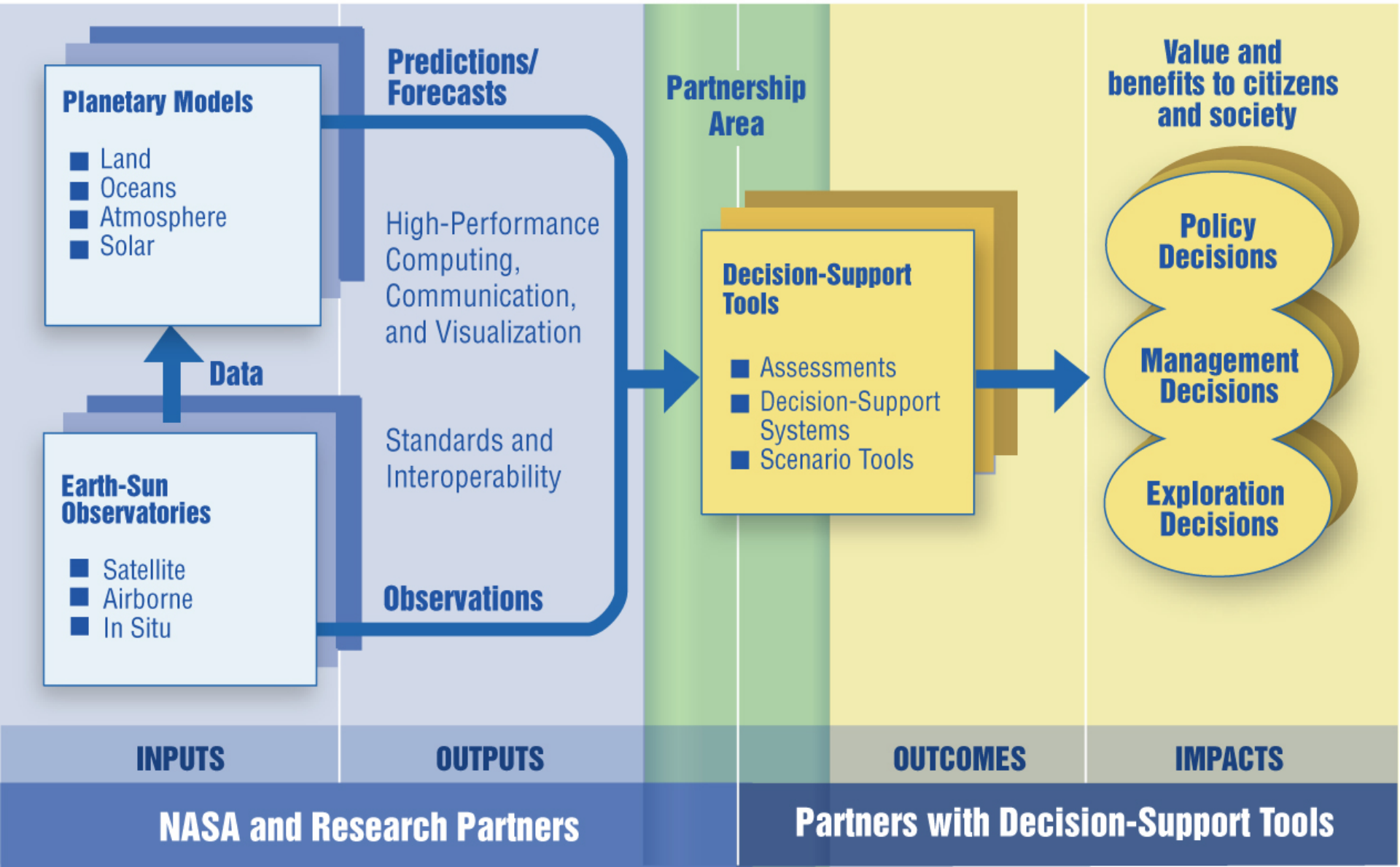
NASA 2006 Strategic Plan

In Sub-Goal 3a: The NASA Applied Sciences Program will continue the Agency's efforts in benchmarking the assimilation of NASA research results into policy and management decision-support tools that are vital for the Nation's environment, economy, safety, and security.

Approach Follows the GEOSS Architecture



Integrating Earth Science into Solutions



Applications of National Priority

Agricultural Efficiency

Air Quality

Coastal Management

Disaster Management

Homeland Security

Invasive Species

Application Program Activities

- Evaluate potential for NASA Earth science products to support partners
- Develop prototype products with partners; verify and validate paths for integration of Earth science products
- Document value and performance
- Support transition of products or techniques
- Communicate results and partners' achievements

Benchmark Reports

Final products are "Benchmark Reports" to document the system performance and improvements

Partial list of reports to date *(http://aiwg.gsfc.nasa.gov):*

USDA Production Estimates and Crop Assessment Division DSS Assimilation, Sept. 2005.

Application of Earth Science Satellite Observations to Improve Environmental Public Health Surveillance Systems, Sept. 2005

AQI - Application of Satellite Data for Forecasting Particle Pollution, Nov. 2003

RSVP Benchmark Report for Public Health, Sept. 2005

Aviation Current Icing Potential, July 2005

Initialization of the NCEP Eta/NAM Model DST with Uncoupled NLDASE Land Surface States, Sept. 2005

Border Security Decision Support System Driven by Remotely Sensed Data Inputs, Sept. 2005

Air Quality – Surface Characteristics, Sept. 2005

Diver Visibility with Navy/NRL, 2004

Globally Assimilated Lateral Boundary Conditions to Improve CMAQ Ozone Estimates, Sept. 2005

Program Projects

- Solicited Projects
  - *usually Cooperative Agreements*
- Directed Projects
- Congressionally-directed Projects
- Rapid Prototypes (recent development)
  - *quick assessment of potential value*
  - *determines if full-scale project is appropriate*

Current and Future Solicitations

Decisions CAN	(Awards 6/05)	Runs FY06-FY08
ROSES 2005*	(Awards 4/06)	Runs FY06 (late) - FY09
ROSES 2006	No solicitation planned	
ROSES 2007	(Awards 10/07)	Runs FY08-FY10
ROSES 2008	(Awards 10/08)	Runs FY09-FY11
ROSES 2009	(Awards 10/09)	Runs FY10-FY12
ROSES 2010	(Awards 10/10)	Runs FY11-FY13

** ROSES: Research Opportunities in Space and Earth Science*
A collective research announcement for all NASA science programs

Ecosystem & Fisheries Related Awards

Recent ROSES05 CAN Awards (April 2006)

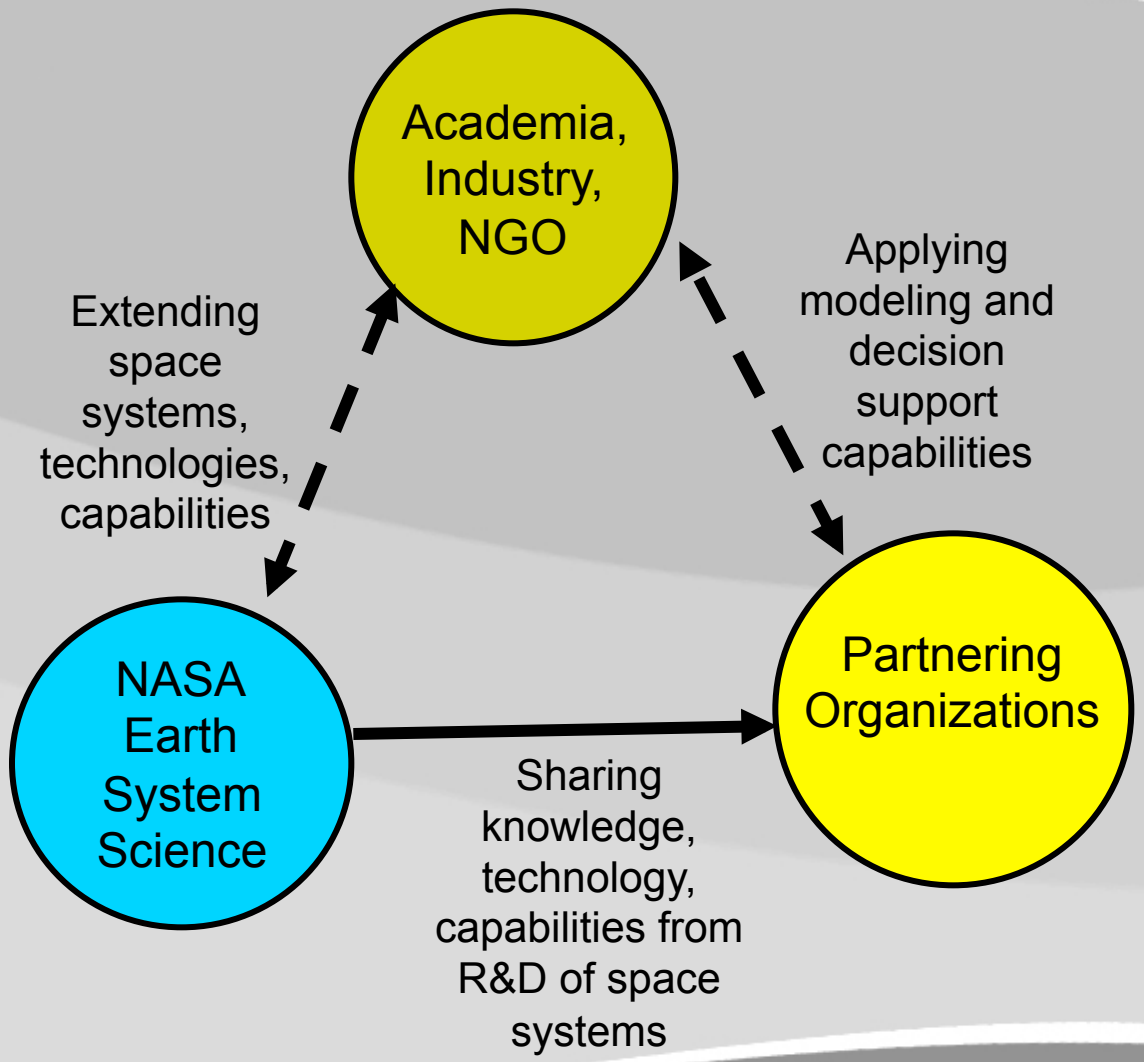
Utilizing remote sensing, modeling and data assimilation to sustain and protect fisheries: ecological forecasting at work

- *Francisco Chavez, PI (MBARI)*

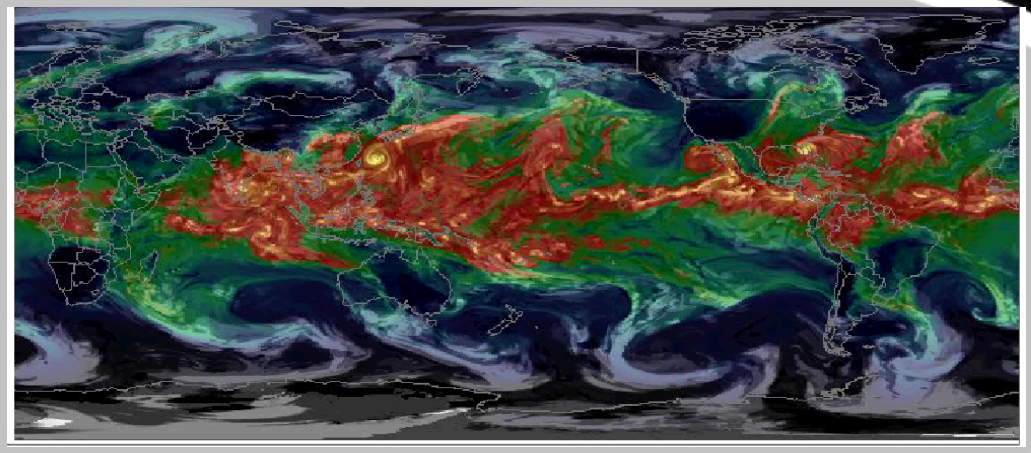
Predicting Right Whale Distributions from Space: Enhancing an Operational System for Marine Ecosystem Modeling

- *Andrew Pershing, PI (Cornell Univ. & Univ. of Maine)*

Community Relationships



Project Columbia & Applied Science's FastPath



NASA Applied Sciences Program has pre-purchased $5M worth of time on Project Columbia for supercomputer use by any & all Applied Sciences supported projects.

Workshop Expectations

$250-300K

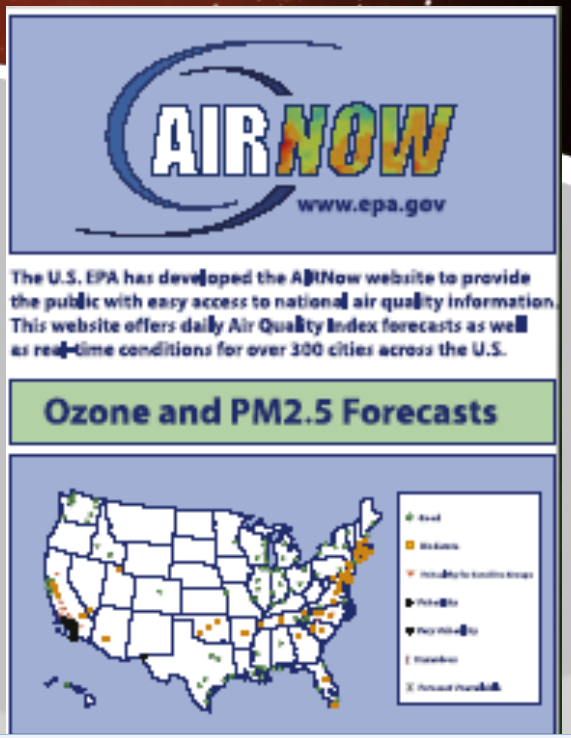
1-4 Project Concepts

Concepts need to allow NOAA/NASA program managers determine if and how to proceed with one or more projects.

Extending NASA Earth Science Results to Federal Partners:

An Example from Air Quality

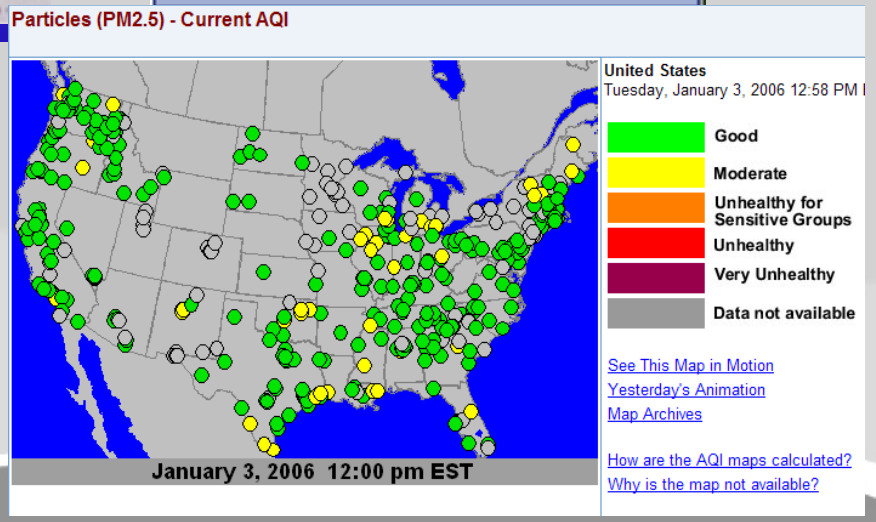
EPA AIRNow



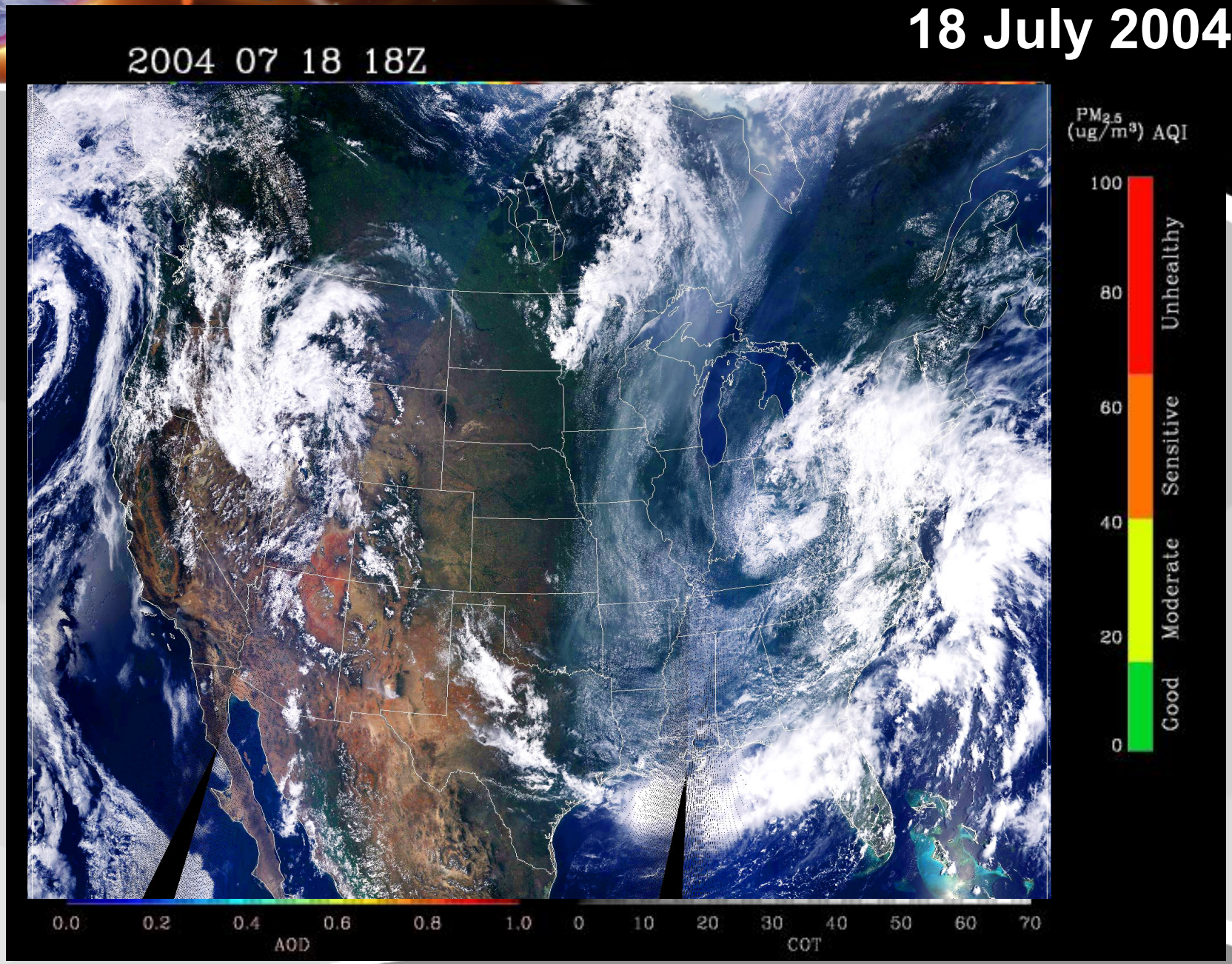
AQI
AIR QUALITY INDEX

www.epa.gov/airnow

- Good
- Moderate
- Unhealthy for Sensitive Groups
- Unhealthy
- Very Unhealthy
- Hazardous

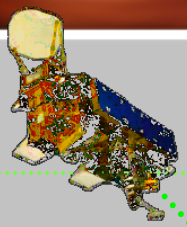


Smoke from Alaskan/Yukon Fires
18 July 2004



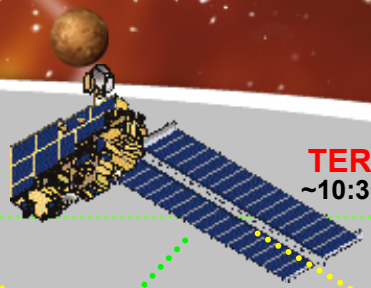
EPA AIRNow Use of NASA MODIS Data

Terra & Aqua Satellite Direct Broadcast of MODIS instrument data via commercially available ground station



AQUA-1 MODIS
~1:30 local overpass

Direct Broadcast



TERRA MODIS
~10:30 local overpass

Products (Near Real Time)

DB Aerosol Optical Depth (MOD04_L2)
DB Cloud Optical Thickness (MOD06_L2)

Products
Aerosol Optical Depth (MOD04_L2)
Cloud Optical Thickness (MOD06_L2)

NASA GFSC DAAC

NASA GFSC Science Team

Products
Algorithms

SSEC/CIMSS Univ. of Wisc.Madison (MIPPS)

NOAA OAR/ARL

Products
EDAS Forecast Data

NASA LaRC

Products
MODIS/AIRNow Data Fusion
Site Static Data

US EPA AIRNow DMC

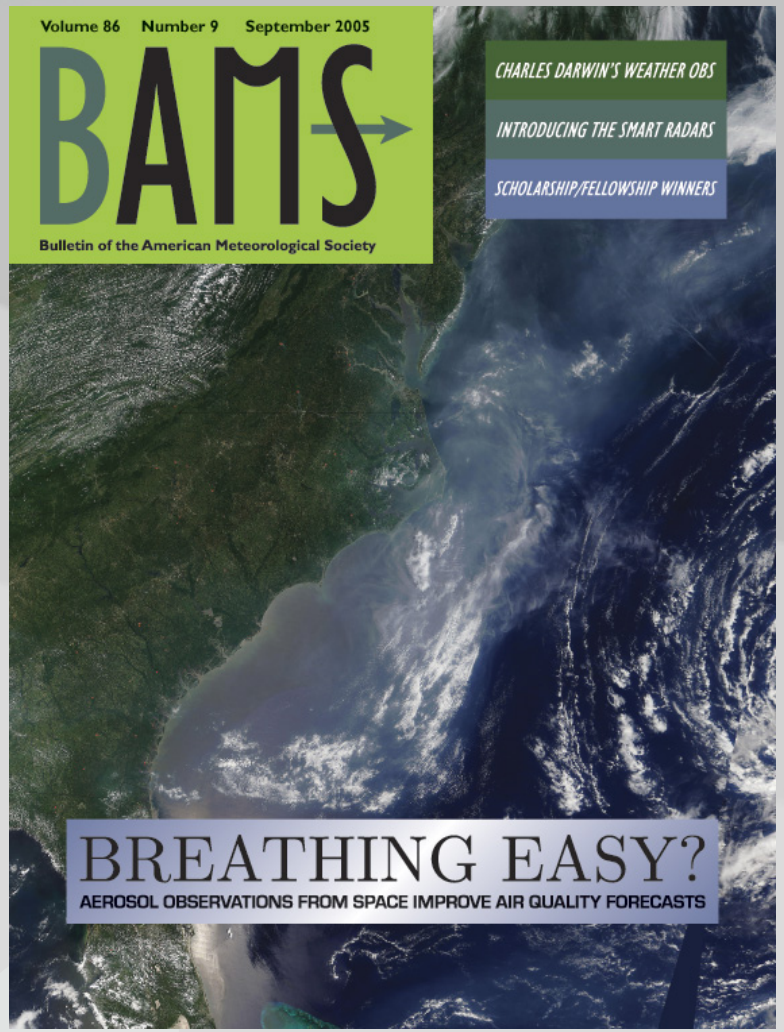
Products
AIRNow Hourly $PM_{2.5}$ Data

AIRNow Forecasters

State & Local

Canadian Providences

Air Quality Forecasting



"Improving National Air Quality Forecasts with Satellite Aerosol Observations"

BAMS, Sept. 2005 (86: 1249-1261)

J. Al-Saadi, J. Szykman, R. B. Pierce, C. Kittaka, D. Neil, D. A. Chu, L. Remer, L. Gumley, E. Prins, L. Weinstock, C. MacDonald, R. Wayland, F. Dimmick, J. Fishman

Questions

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Websites:

http://science.hq.nasa.gov/earth-sun/applications/

http://aiwg.gsfc.nasa.gov/

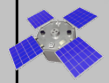
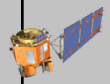
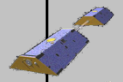
Backup

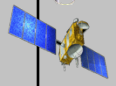
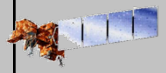
Systematic Approach

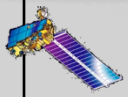
- **Evaluation** of potential capacity for NASA research results to contribute to partnering agency decision support tools
  - Formulation of a configuration to integrate results
- **Verification** that components could be physically connected into system configuration
- **Validation** of science and technology performance of the system through rigorous analysis of flow through of science data products in the integrated system
- **Benchmarking** of performance of the integrated system solution outputs in terms of value to decision makers.

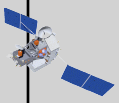
Flight Missions in “extended period”

Spacecraft	2006	2007	2008	2009	2010	2011	2012
ACRIMSAT							
EO-1							
GRACE							
ICESat							
Jason-1							
LandSat-7							
QuikSCAT							
Terra							
TOMS-EP							
TRMM							

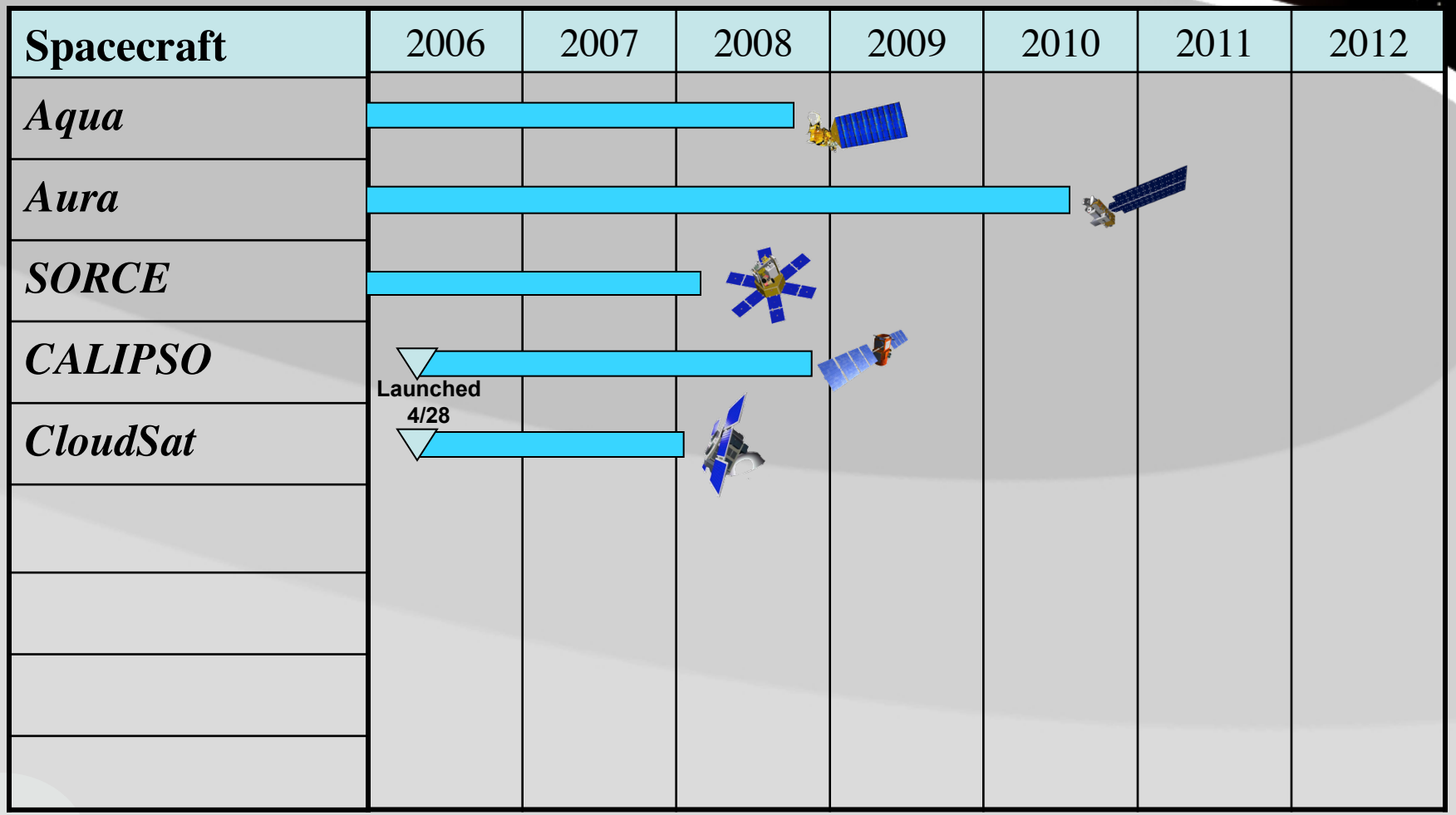




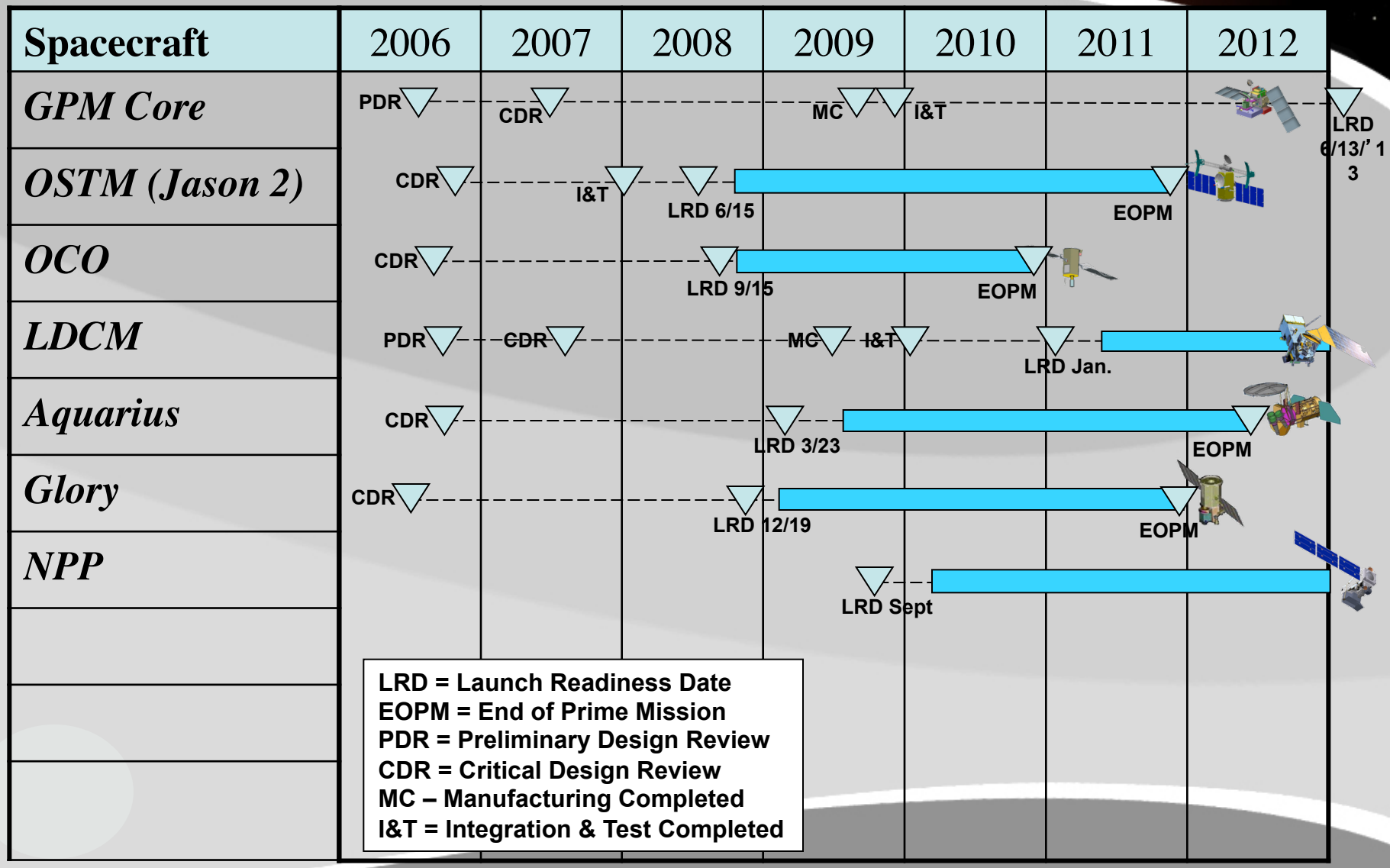




Flight Missions in “primary period”



Flight Missions in "formulation/development"



Decisions CAN & ROSES A.24

Decisions CAN

Total Step-2 Full Proposals: 172

Awards: 24 proposals (18 projects)

Agriculture Efficiency	23
Air Quality	11
Aviation	12
Carbon Management	7
Coastal Management	18
Disaster Management	52
Ecological Forecasting	29
Energy Management	2
Homeland Security	7
Invasive Species	10
Public Health	11
Water Management	22
Solutions Networks	15

MODIS – By far the most often mentioned sensor.

ROSES A.24

Total Step-2 Full Proposals: 98

Awards: 21 projects (April 06)

Agriculture Efficiency	10
Air Quality	17
Aviation	7
Carbon Management	1
Coastal Management	17
Disaster Management	15
Ecological Forecasting	9
Energy Management	3
Homeland Security	4
Invasive Species	4
Public Health	5
Water Management	16
Solutions Networks	6

Numbers include proposals serving more than one application.